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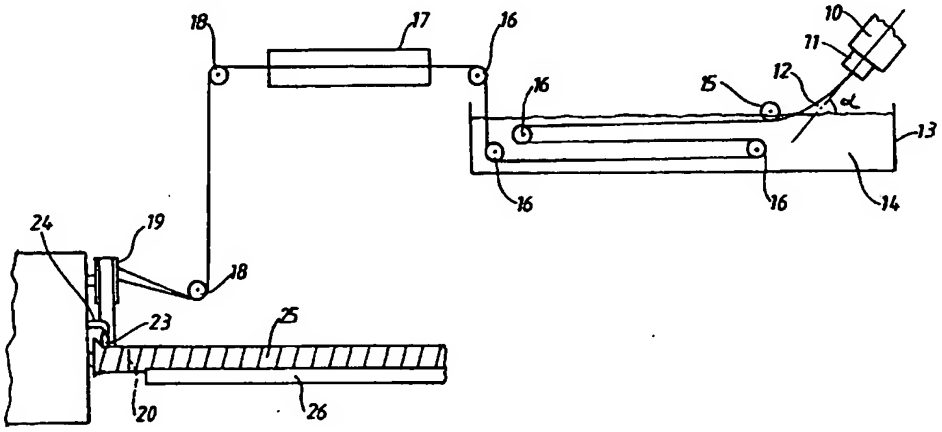
(54) Title: METHOD AND DEVICE FOR MANUFACTURING A VACUUM CLEANER HOSE



(57) Abstract: This invention relates to a method for producing a plastic work piece to a spiral shaped vacuum cleaner hose. The work piece is produced by means of an extrusion method through a nozzle opening shaped as a continuous slot having at least two aligned, mainly flat parts (26, 27) that are separated by means of a, from the flat parts extending, mainly U-shaped first part (28). One of the flat parts (26) is connected to a second mainly U-shaped part (29) whereas the second flat part (27) is connected to a flange shaped portion (21) extending from the second flat part and intended to be joint to the second U-shaped part (29). The work piece is after extrusion mainly stretched to its final shape between the nozzle (11) and a guide (15) that is dimensioned such that its shape mainly corresponds to the final work piece the dimensions of the final work piece being considerably less than the dimensions of the nozzle opening. The work piece is in connection to the guide cooled by means of a liquid (14) the nozzle being directed such that the work piece during extrusion leaves the nozzle (11) at an angle with respect to the liquid surface. The invention also relates to a device for manufacturing said hose and a hose produced according to the method.

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METHOD AND DEVICE FOR MANUFACTURING A VACUUM CLEANER HOSE

This invention relates to a method and a device for manufacturing a work piece for a vacuum cleaner hose and a hose produced according to the method.

It is previously known to produce vacuum cleaner plastic hoses by spiral winding a narrow strip shaped work piece having an outwardly extending U-shaped corrugation on a mandrel at the same time as adjacent parts of the work piece are forced to overlap and be glued to one another. The hose produced in this manner provides a certain degree of flexibility in the length direction of the hose at the same time as the hose because of the corrugations is comparatively stiff in the radial direction. In order to further increase the stiffness of a similar hose it has also been suggested, see JP 09-14526, to use a work piece having two corrugations the corrugations being stiffened by filling the corrugations with glue from the inside of the hose. Even if it might be desirable to increase the stiffness of the hose in the radial direction it could be a disadvantage to simultaneously decrease the flexibility in the axial direction since it, when the vacuum cleaner is placed in a certain position, decreases the working area for the nozzle connected to the hose. It is also , depending on the oblique pulling effect during the spiral winding, difficult in practice to produce a hose by means of the work piece shown in the Japanese publication unless the width of the strip is limited to mainly the same width as the work pieses that are used when manufacturing conventional vacuum cleaner hoses.

The purpose of this invention is to achieve a vacuum cleaner hose having mainly the same properties with regard to dimensions, stiffness, strength and flexibility as previously known conventional hoses but making it possible to produce the hose in about half the time needed for a conventional hose which means a considerable cost reduction of the hose. This is

achieved by means of a method and a device having the characteristics mentioned in the claims.

An embodiment of the invention will now be described with reference to the accompanying drawing on which Fig. 1 schematically shows a device for producing the hose whereas Fig. 2 shows a length section through the hose.

The device shown in Fig. 1 comprises a plastic extrusion apparatus 10 for plastic having a nozzle 11 with an opening for a plastic string work piece 12. The opening has a shape corresponding to the shape of the work piece with the difference that the opening is oversized with respect to the finished work piece. The nozzle 11 is arranged such that the extruded plastic string is directed obliquely downwards towards a container 13 with cooling liquid 14, preferably water, in which the plastic string is cooled and hence stabilized. Close to the liquid surface there is a guide 15 that comprises one or several profiled rolls corresponding to the shape of the finished work piece. In the container as well as above it there are several pulleys 16 on which the work piece is pulled to a dryer 17 where the liquid evaporates from the work piece. The work piece runs via additional pulleys 18 to a stretch roller 19 that stretches the work piece between the nozzle 11 and the guide 15. From the stretch roller 19 the work piece is moved to a cylinder shaped or conical rotating mandrel 20 one edge part 21 of the work piece (see Fig. 2) joining the other edge part 22 of the adjacent winding at the same time as a glue string 23 is extruded from a nozzle 24 and is applied between said edge parts. During the spiral shaped winding on the mandrel the glue is hardened and secures adjacent windings to one another at the same time as the manufactured hose 25 is fed to the right in the figure on two rotating rolls 26 after which the hose 25 by means of a cutting device is cut into suitable lengths.

The strip shaped work piece 12 shown in Fig. 2 comprises , as seen in section, two aligned flat parts 26 and 27 that are separated by means of a mainly U-shaped , extending first part 28 and that is limited by a mainly U-shaped extending second part 29 whose outer free end forms said first edge part 22 and by said second edge part 21 that is shaped as a flange extending in the same direction as the U-shaped parts.

Thus, the shape of the strip shaped work piece corresponds to the shape of the nozzle opening but the nozzle opening has considerably larger dimensions than the final work piece the stretching of the work piece creating this change in dimension where the string is ductile, i.e. at the area between the guide 15 and said opening, by controlling the speed of the stretch roller 19 with respect to the speed of the extruded string. The stretching and the inclination α

of the nozzle with respect to the surface of the cooling liquid is chosen such that the outlet direction from the nozzle coincides with the direction of extrusion i.e. that the string is not broken in any direction immediately after leaving the nozzle. The angle α is larger than 10° and is preferably abt 20°. The finished work piece has a width within the interval 10-20 mm and preferably is abt 14 mm whereas the height of the U-shaped portions is within the interval 2-6 mm is and preferably abt 3,9 mm. The nozzle opening has, as have been said before, a shape corresponding to the final work piece but has considerably larger dimensions i.e. a with which is abt 18-25 mm, preferably abt 21 mm and a height of 5-8 mm, preferbaly 6,5 mm for the U-shaped portions. The temperature of the cooling liquid is less than 20°C and is preferably abt 18 °C.

Thus, this method and device gives a possibility to achieve a 50% reduction of the production time because of the increased width of the work piece. It should also be mentioned that said U-shape in this connection should not be interpreted in the strict way bu that it also is possible to use other similar shapes such as a V-shape or an Ω-shape.

Claims

1. Method for producing a plastic work piece to a spiral shaped vacuum cleaner hose **characterized in** that the work piece is produced by means of an extrusion method through a nozzle opening shaped as a continious slot having at least two aligned, mainly flat parts that are separated by means of a, from the flat parts extending, mainly U-shaped first part one of the flat parts being connected to a second mainly U-shaped part whereas the second flat part is connected to a flange shaped portion extending from the second flat part and intended to be joint to the second U-shaped part; that the work piece after extrusion is mainly stretched to its final shape between the nozzle and a guide that is dimensioned such that its shape mainly corresponds to the final work piece, the dimensions of the final work piece being considerably less than the dimensions of the nozzle opening; that the work after extrusion is cooled by menas of a liquid, the nozzle being directed such that the work piece during extrusion leaves the nozzle at an angle with respect to the liquid surface.

2. Method according to claim 1, **characterized in** that said angle is more than 10 ° and preferably is abt 20 °.

3. Method according to claim 1 or 2, **characterized in** that said final work piece has a width which is 10-18 mm and preferably abt 14 mm.

4. Method according to any of the preceding claims, **characterized in** that the height of the U-shaped parts of the final work piece is within the interval 2-6 mm and preferably is abt 3,9 mm.

5. Method according to any of the preceding claims, **characterized in** that the nozzle opening has larger dimensions than the final work piece and a shape corresponding to the final work piece, the width of the nozzle opening being within the interval 18-25 mm and preferably is abt 21 mm.

6. Method according to claim 5, **characterized in** that the height of the U-shaped parts of the nozzle opening is within the interval 2-8 mm and preferably is abt 6,5 mm.

7. Method according to any of the preceding claims, **characterized in** that the temperature of the cooling liquid is abt 18°C.

8. Device for carrying out the method according to claim 1, **characterized in** that it

comprises a plastic extrusion nozzle (10) having a nozzle opening shaped as a continious slot having at least twol aligned , mainly flat parts (26,27) that are separated by means of a, from the flat parts extending, mainly U-shaped first part (28) one of the flat parts (26) being connected to a second mainly U-shaped part (29) whereas the second flat part (27) is connected to a flange shaped portion (21) extending from the part and intended to be joint to the second U-shaped part (29) during winding; a guide (15) placed at a distance from the nozzle opening and intended to guide the work piece (12) extruded from the nozzle opening the guide being dimensioned such that its shape mainly corresponds to the final work piece the dimensions of the final work piece being considerably less than the dimensions of the nozzle opening; means (19) for stretching the extruded work piece; a cooling liquid container (13) placed close to the guide (15) the nozzle opening being directed such that the work piece during extrusion leaves the nozzle at an angle (α) with respect to the liquid surface.

9. Device according to claim 8, **characterized in** that said angle is more than 10 ° and preferably is abt 20 °.

10 Device according to any of claims 8-9, **characterized in** that the height of the U-shaped parts of the final work piece is within the interval 2-6 mm and preferably is abt 3,9 mm.

11. Device according to any of claims 8-10, **characterized in** that the nozzle opening has larger dimensions than the final work piece and a shape corresponding to it the width of the nozzle opening being within the interval 18-25 mm and preferably being abt 21 mm.

12. Device according to claim 11, **characterized in** that the height of the U-shaped parts of the nozzle opening is within the interval 2-8 mm and preferably is abt 6,5 mm.

13. Vacuum cleaner hose **characterized in** that it is produced by means of the method according to any of claims 1-7.

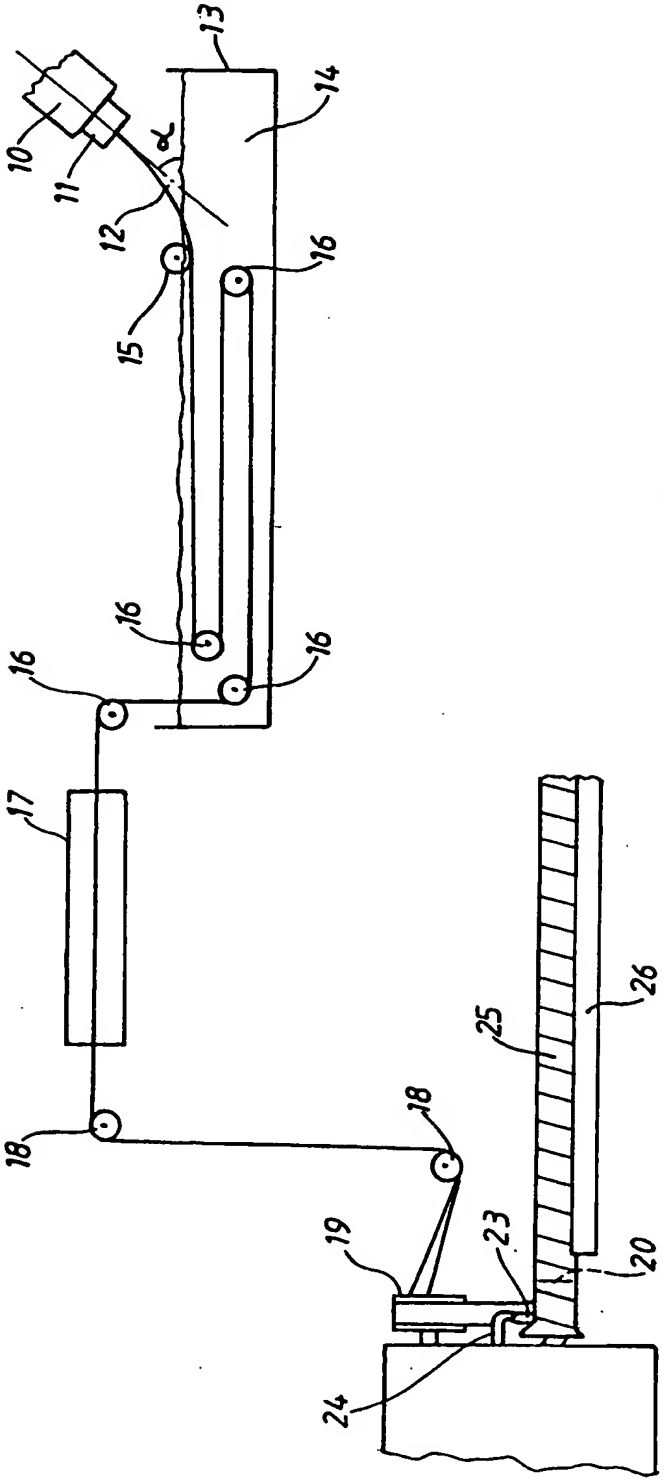

FIG. 1

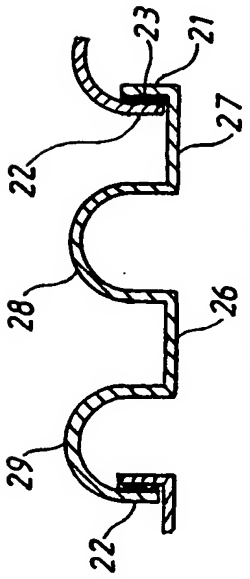

FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/01801

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B29D 23/18, A47L 9/24, F16L 11/16
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A47L, B29D, F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EDOC,WPI,PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 9014526 A (TIGERS POLYMER CORP) 1997-05-30 (abstract) (online) (retrieved on 2000-12-19). Retrieved from: EPO PAJ Database. Figures 1-4, abstract.	1-13
A	US 2739089 A (B.H. HAGELTORN), 20 March 1956 (20.03.56), figures 1,4	1-13
A	US 4310946 A (JOHN C. BAKER ET AL), 19 January 1982 (19.01.82), figures 9,11, abstract	1-13

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"P" document published prior to the international filing date but later than the priority date claimed
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"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

Information on patent family members

04/12/00

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2739089 A	20/03/56	NONE	
US 4310946 A	19/01/82	CA 1141907 A	01/03/83
		DE 3001529 A,C	07/08/80
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		FR 2446977 A,B	14/08/80
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